



Installation and Operating Instructions

JUDO Reverse Osmosis System JOS 16-30 G



Please issue to the owner/operator.
Read carefully before installation/start-up!
Subject to change without notice.



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1 Introduction

Thank you for making JUDO your brand of choice. Please take note of, and follow this instruction manual so that you can enjoy your unit for a long time. This instruction manual contains all the information needed for the installation, operation and maintenance of the described unit.

We make every effort to ensure you are a satisfied customer and ask that you contact your local JUDO representative if you have any questions concerning water treatment, e.g. adding further features to your existing system. Please quote the data given on the name plate with all enquiries.

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1.1 Pictograms and their meaning

The words **Warning**, **Caution** and **Note**, highlighted in bold with matching pictogram, have the following meaning:



Warning **risk of injuries and accidents!**



Caution **risk of malfunctions or damage to the unit!**



Note **a special feature exists!**



1.2 Warranty

The warranty, as defined in our General Terms & Conditions of Sale and Delivery, only applies if

- The unit is used according to the explanations in this instruction manual.
- The unit has not been opened or improperly handled in some other way.
- Repairs have been carried out by authorised, qualified employees only.
- Original spare parts only are used for repairs.

1.3 Operation of the unit

The reverse osmosis system described here is used to generate demineralised water.



Warning

Other uses are deemed to be undue, non-intended uses and are not allowed. JUDO Wasseraufbereitung GmbH is not liable for any losses whatsoever resulting from these applications!

1.4 Duties of the owner/operator

The owner/operator of the system is responsible for the following:

- Instructing the operating personnel.
- Arranging regular maintenance.

1.5 Safety instruction



Warning

Do not open system parts!

Do not open electronics and sensor components!

Repairs are to be carried out by authorised, qualified personnel only!

Use the specified types of electrical cables only!

The mains switch must always be disconnected from the power supply before starting repair work!



2 Transport/Scope of Supply/Storage

Transport:

- Transport unit carefully!

Scope of supply:

JUDO reverse osmosis systems are designed and built as a ready for installation unit. All equipment required for operation, control and monitoring is easily accessible and clearly arranged. In addition, diverse components can be retrofitted as options.

Each JUDO reverse osmosis system consists of the following parts:

- Cartridge filter with a fineness (particle rating) of 5 µm as safety filter for protection against finest contaminants.
- High-pressure pump for increasing the raw water pressure to the required operating pressure.
- Reverse osmosis modules: number and size required according to the designed output.
- Control valves for adjusting the brine and brine recirculation flow.
- Internal connection pipe from the raw water connection up to the product water or brine discharge outlets. All the necessary shut-off and control valves as well as the measuring instruments are integrated.
- Measuring instruments for pressure, flow and conductivity.
- Electrical control according to the relevant VDE guidelines. Ready for connection with electrical components wired. Including centralised fault indication.



Note

The osmosis system is preassembled on a frame!

Double softener system is enclosed separately and is preassembled!

Consumables (operating materials) are not included in the scope of supply!

Please check the delivered items are complete with respect to your order and are intact!

The units are transported and delivered complete and fully assembled!

Transport damage must be reported within 24 hours otherwise, for insurance reasons, loss claims cannot be settled!

Storage:

- Dry, cool storage location.
- The membranes must be kept moist at all times and the preservative must be replaced every 6 months.
- Allowable storage temperature: 0 °C to +30 °C

2.1 Accessories

- Reverse osmosis system cleaning and flushing equipment on request

Resources (operating materials): (depending on area of use)

JUDO water testing equipment

- | | |
|--|----------------------|
| • Total hardness Type B | Order No.: 8 690 013 |
| • Pocket conductivity tester Type JPLF
(measuring range 0 – 100 µS) | Order No.: 8 690 003 |
| • JUDO chemicals protection equipment | Order No.: 8 520 170 |
| • Anti-scaleant | on request |
| • Cleaners (detergents) | on request |
| • Filter cartridges (set) JFK-AK 5 – 10“ (activated carbon) | Order No.: 8 714 599 |
| JFK-PP 5 – 10“ (polypropylene) | Order No.: 8 714 597 |

A JUDO E-Reihe activated carbon filter, alt. Sulphite dosing system is required for the use with heavily chlorine treated water.

3 Product Information

3.1 Manufacturer and type

Manufacturer:

JUDO-Wasseraufbereitung GmbH

Hohreuschstraße 39-41

D-71364 Winnenden

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Type:

JUDO reverse osmosis system JOS 16-30G

Model	Order No.
JOS 16G	8471011
JOS 20G	8471012
JOS 30G	8471013



3.2 Operating data

Model JOS	16G	20G	30G
No. of pressure vessels	3	2	3
No. of membranes per pressure vessel	1	2	2
Permeate flow per hour. [l/h]	800	1100	1600
Permeate production per day [m³/d]	19,2	26,4	38,4
HP-pump flow per hour. [m³/h]	1,81	2,14	2,58
Feed recovery [%]	75	75	75
Feed flow per hour [l/h]	1067	1467	2133
brine flow per hour. [l/h]	267	367	533
Recirculate flow per hour [l/h]	744	670	452
Max. water temperature [°C]	30	30	30
Max. ambient temperature [°C]	35	35	35
Feed pressure min. / max. [bar]	3 / 6	3 / 6	3 / 6
Max. operating pressure [bar]	16	16	16
Max. permeate counter pressure [bar]	0,5	0,5	0,5
Max. brine-counter pressure [bar]	1,0	1,0	1,0
Nominal flow HP-pump [m³/h]	3	3	3
Nominal power consumption HP-pump [kW]	2,2	2,2	2,2
Nominal current HP-Pump [A]	4,45	4,45	4,45
voltage / frequency HP-pump [VAC / Hz]	3x400 / 50	3x400 / 50	3x400 / 50
Protection classification HP-pump	IP 55	IP 55	IP 55
voltage / frequency control box [VAC / Hz]	230 / 50	230 / 50	230 / 50
Protection classification control box	IP 54	IP 54	IP 54
voltage / frequency power contactor [VAC / Hz]	3x400 / 50	3x400 / 50	3x400 / 50
Protection classification power contactor	IP 54	IP 54	IP 54

The a.m. values refer to the design data.
Performance data after 3 years!

Design data:

Total salt content	500mg/l NaCl
Raw water	12 °C, < 0.1 °dH
Silt density index	<3
Fouling index	15%
System-salt rejection capacity	approx. 95-98%

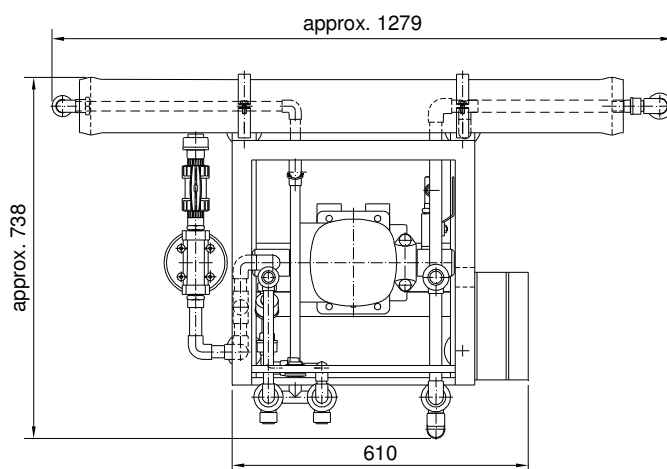
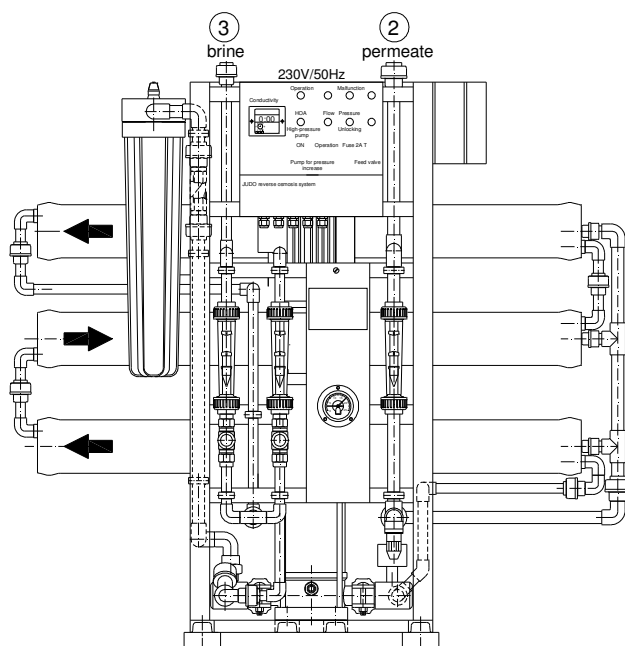


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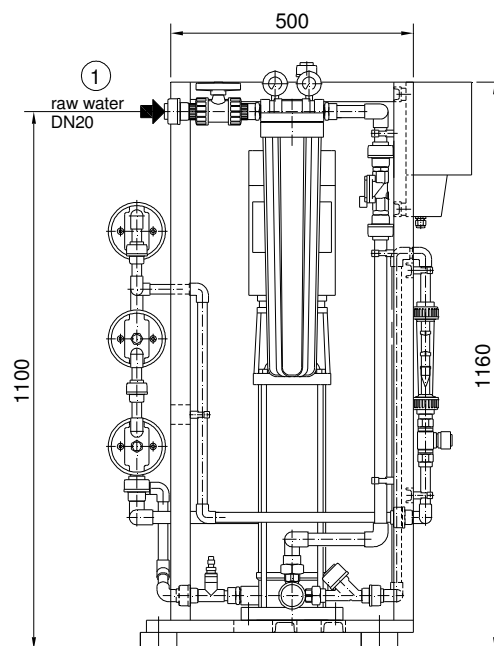
If the feed water quality varies from the design data, the performance of the unit will be different or changes. In this case please contact our specialists!



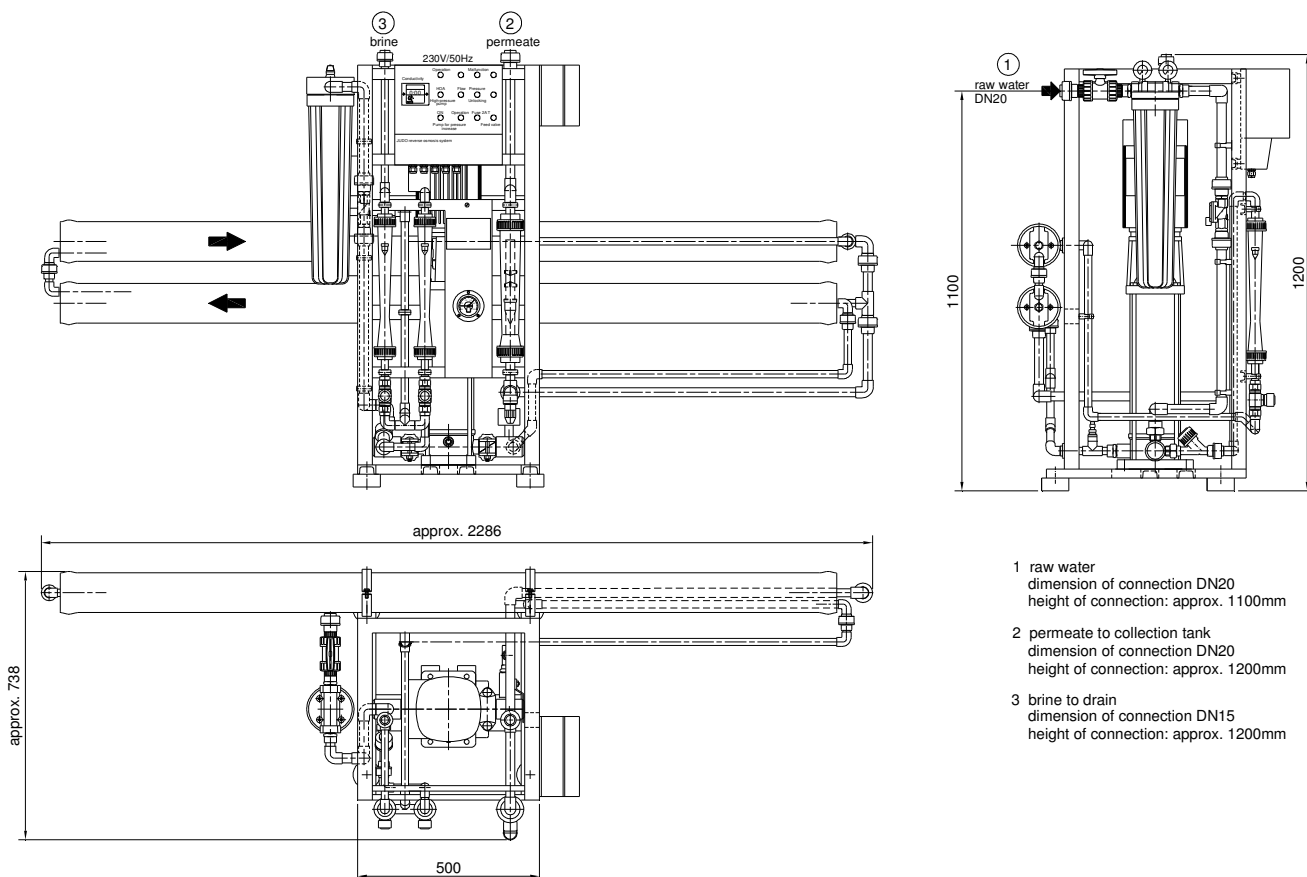
3.3 Dimensions



Dimensions JOS 16G



- 1 raw water
dimension of connection DN20
height of connection: approx. 1100mm
- 2 permeate to collection tank
dimension of connection DN20
height of connection: approx. 1200mm
- 3 brine to drain
dimension of connection DN15
height of connection: approx. 1200mm



Dimensions JOS 20G

- 1 raw water
dimension of connection DN20
height of connection: approx. 1100mm
- 2 permeate to collection tank
dimension of connection DN20
height of connection: approx. 1200mm
- 3 brine to drain
dimension of connection DN15
height of connection: approx. 1200mm

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Version: 1.000

JUDO Wasseraufbereitung GmbH

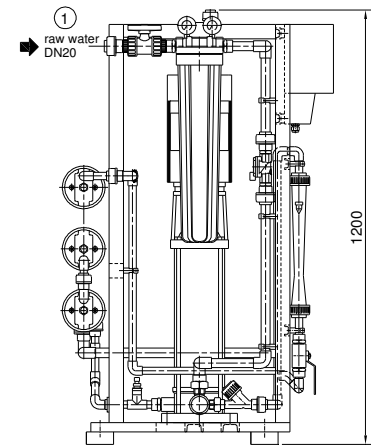
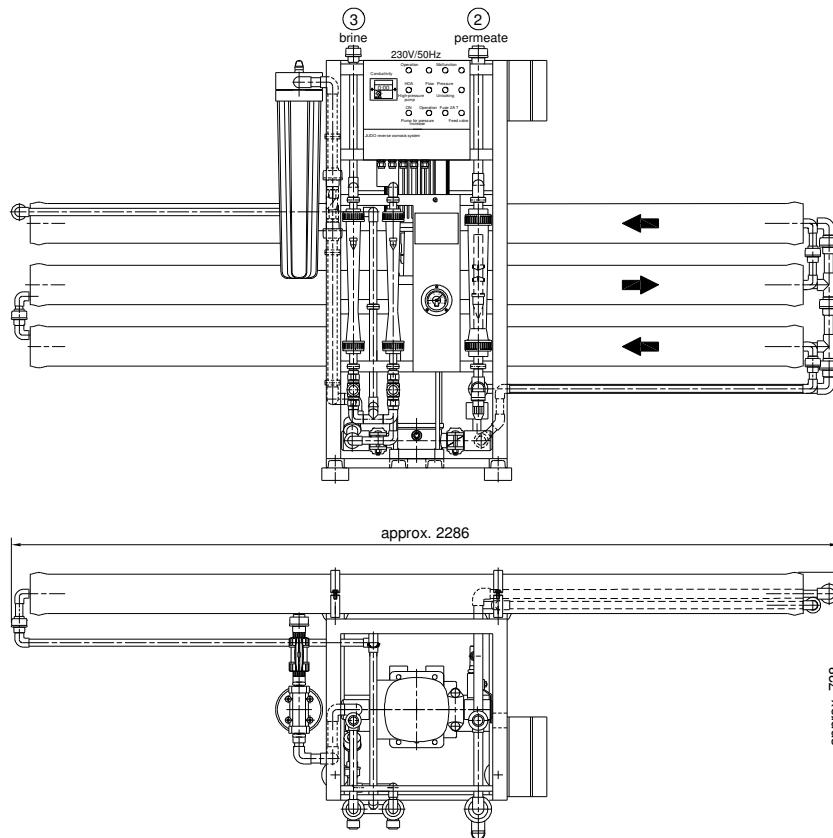
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In the interests of engineering progress, subject to change without notice!



- 1 raw water
dimension of connection DN20
height of connection: approx. 1100mm
- 2 permeate to collection tank
dimension of connection DN20
height of connection: approx. 1200mm
- 3 brine to drain
dimension of connection DN15
height of connection: approx. 1200mm

Dimensions JOS 30G



Note

For mounting or replacing of the RO-membranes minimum space of 1 meter on each side of the plant is needed!



3.4 Scope of application

JUDO reverse osmosis systems are used in the treatment of drinking water, for the treatment of boiler feed water, feed water for cooling and air conditioning systems and wherever it is necessary to demineralise drinking and non-drinking water.

The product water quality is directly dependent on the raw water quality. The residual salt content is approximately 3-5 % of the initial salt content.



Caution

The owner/operator must ensure that the reverse osmosis system is used for the purposes specified in the use guidelines only!

The reverse osmosis systems may never be operated with raw water whose water quality requirements are outside the guidelines shown above (temperature, hardness, salt content, etc.)!

3.5 Function

The JUDO reverse osmosis system is switched on and off in Auto mode by external consumption switches (e.g. level switches in the JUDO product water tank).



4 Installation

4.1 Location requirements

The JUDO reverse osmosis system must be installed in a dry and frost proof place. Safety equipment, e.g. a drain connection, must be available. The power supply must be installed by a qualified electrician in compliance with the local VDE or EVU (electricity utility company) regulations.

4.2 Installation instructions

- Note water pressure and quality given in the specifications.
- Ensure sufficient installation space for easy operation and maintenance.
- Local or DIN 1988, DIN 19635 and European standards (EN) must be adhered to at all times.
- Technical information, local installation regulations and general guidelines (e.g. EVU, VDE, WVU, DIN, DVGW, ÖVGW, SVGW) are to be noted and followed.

Solutions to problems and other installation options can be clarified by JUDO's technical advisers.



Note

Do not switch on voltage supply until the reverse osmosis system is to be put into operation!

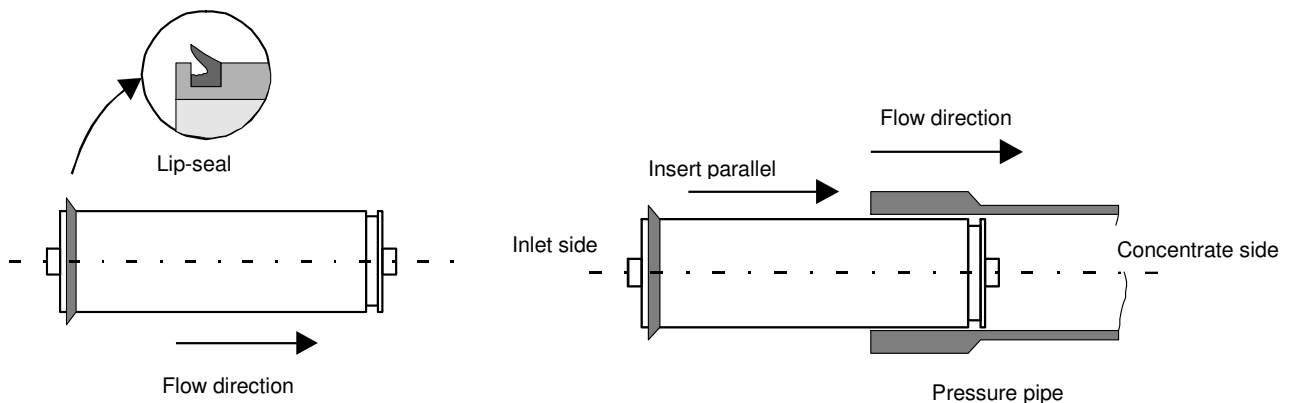
4.3 Installation

All installations are to be carried out according to the local regulations and current standards (DIN 1988, VDE 0100 and 0105, etc.). The work must be carried out by qualified personnel. The system must be installed so that enough space is available for maintenance and inspection work. The point of use must be frost proof and protected against direct exposure to light. The reverse osmosis elements are delivered separately, welded airtight in preservative fluid. They should not be installed until just before the putting into service, as described under 4.4.



4.4 Installation instructions for reverse osmosis elements

- Unscrew the piping at the top end of the pressure pipes.
- Remove clamping ring and top end plate.
- Remove the element from the packaging.
- **Grease pressure pipe generously, lip seal and element with Vaseline!**
- Place element in the pressure pipe (note flow direction)!
- The flow direction as well as the element number on the element and pressure pipe (each indicated by arrows or numbers) must be matched.
- Element must clearly penetrate the bottom end plate.
- Each pressure pipe or element has a corresponding end cap and liner.
- Check position and location of the inner end cap or liner:
- End cap: Installation on the side on which the end plate is sealed with plug.
- Liner: Installation on the side on which the permeate is removed (end plate without plug but with permeate piping instead).
- Put on the top end plate.
- Insert clamping ring.
- Re-attach threaded couplings.



Caution

When starting up the system at least 4 hours of permeate must be discarded until the preservative solution has been completely flushed out!



5 Reverse osmosis

Reverse osmosis is a filtration process that is often used for water. It works by using pressure to force water (Feed water) through a membrane, retaining the solute (brine) on one side and allowing the pure solvent (permeate) to pass to the other side. This is the reverse of the normal osmosis process, which is the natural movement of solvent from an area of low solute concentration, through a membrane, to an area of high solute concentration when no external pressure is applied.

Formally, reverse osmosis is the process of forcing a solvent from a region of high solute concentration through a membrane to a region of low solute concentration by applying a pressure in excess of the osmotic pressure.

The membranes used for reverse osmosis have a dense barrier layer in the polymer matrix where most separation occurs. In most cases the membrane is designed to allow only water to pass through this dense layer while preventing the passage of solutes (such as salt ions). This process requires that a high pressure be exerted on the high concentration side of the membrane, usually 2–17 bar (30–250 psi) for fresh and brackish water, and 40–70 bar (600–1000 psi) for seawater, which has around 24 bar (350 psi) natural osmotic pressure which must be overcome.

This process is best known for its use in desalination (removing the salt from sea water to get fresh water), but it has also been used to purify fresh water for medical, industrial and domestic applications since the early 1970s.

Osmosis describes how solvent moves between two solutions separated by a semipermeable membrane to reduce concentration differences between the solutions. When two solutions with different concentrations of a solute are mixed, the total amount of solutes in the two solutions will be equally distributed in the total amount of solvent from the two solutions. Instead of mixing the two solutions together, they can be put in two compartments where they are separated from each other by a semipermeable membrane. The semipermeable membrane does not allow the solutes to move from one compartment to the other, but allows the solvent to move. Since equilibrium cannot be achieved by the movement of solutes from the compartment with high solute concentration to the one with low solute concentration, it is instead achieved by the movement of the solvent from areas of low solute concentration to areas of high solute concentration. When the solvent moves away from low concentration areas, it causes these areas to become more concentrated. On the other side, when the solvent moves into areas of high concentration, solute concentration will decrease. This process is termed osmosis. The tendency for solvent to flow through the membrane can be expressed as "osmotic pressure", since it is analogous to flow caused by a pressure differential.

In reverse osmosis, in a similar setup as that in osmosis, pressure is applied to the compartment with high concentration. In this case, there are two forces influencing the movement of water: the pressure caused by the difference in solute concentration between the two compartments (the osmotic pressure) and the externally applied pressure.

5.1 Pre-treatment

The life cycle of a RO-membrane depends mostly on the raw water quality. The hazard of nonreturnable scaling and fouling depends on physical and chemical properties and processes.

5.2 Membrane-fouling

Membrane fouling is defined as the process in which solute or particles deposit onto the membrane surface or into membrane pores such that membrane performance is deteriorated. It presents major obstacle for the wide spread use of this technology. Membrane fouling can cause severe flux decline and affect the quality of the water produced. Severe membrane fouling may require intense chemical cleaning or membrane replacement. As a result, operating costs of a treatment plant is therefore increased. There are various types of foulants namely colloidal (clays, flocs), biological (bacteria, fungi), organic (oils, polyelectrolytes, humics) and scaling (mineral precipitates).

5.3 Membrane-scaling

Scaling occurs on RO membranes when the concentration of scale-forming species exceeds saturation, producing additional solids within the RO feedwater. Scalants include such chemical species as calcium carbonate, calcium sulfate, barium sulfate, strontium sulfate, and reactive silica. Since these species have very low solubilities, they are difficult to remove from RO membranes. Scaling decreases the effectiveness of the membranes in reducing the solids and causes more frequent cleanings. A scale on a membrane provides nucleation sites that increase the rate of formation of additional scale.



Warning

As feed water softened water (0°dH) has to be used. For alternatives please contact our specialists!



6 Commissioning

The commissioning should be carried out by JUDO's customer service or an authorised specialist company only. The data set on commissioning must be entered on the handover confirmation.



Caution

When starting up the system at least 4 hours of permeate must be discarded until the preservative solution has been completely flushed out!

6.1 Starting up the reverse osmosis

The JUDO reverse osmosis system can only be started up if the pre-treatment stages such as:

- JUDO protective filter.
- JUDO backflow preventer.
- JUDO softener.
- JUDO metering system.

Do not prevent the start. Ensure that:

- the shut-off valve is open.
- system is correctly installed.
- 5 µm filter cartridges are installed.
- reverse osmosis modules are installed.
- pre-treatment systems are ready for operation.
- all operating and monitoring equipment is correctly set.
- all operating values conform to the technical data.
- raw water and electrical energy are available according to the technical data.
- pump direction of rotation has been checked.
- there are no shut-off valves installed in the product water (permeate) pipe.

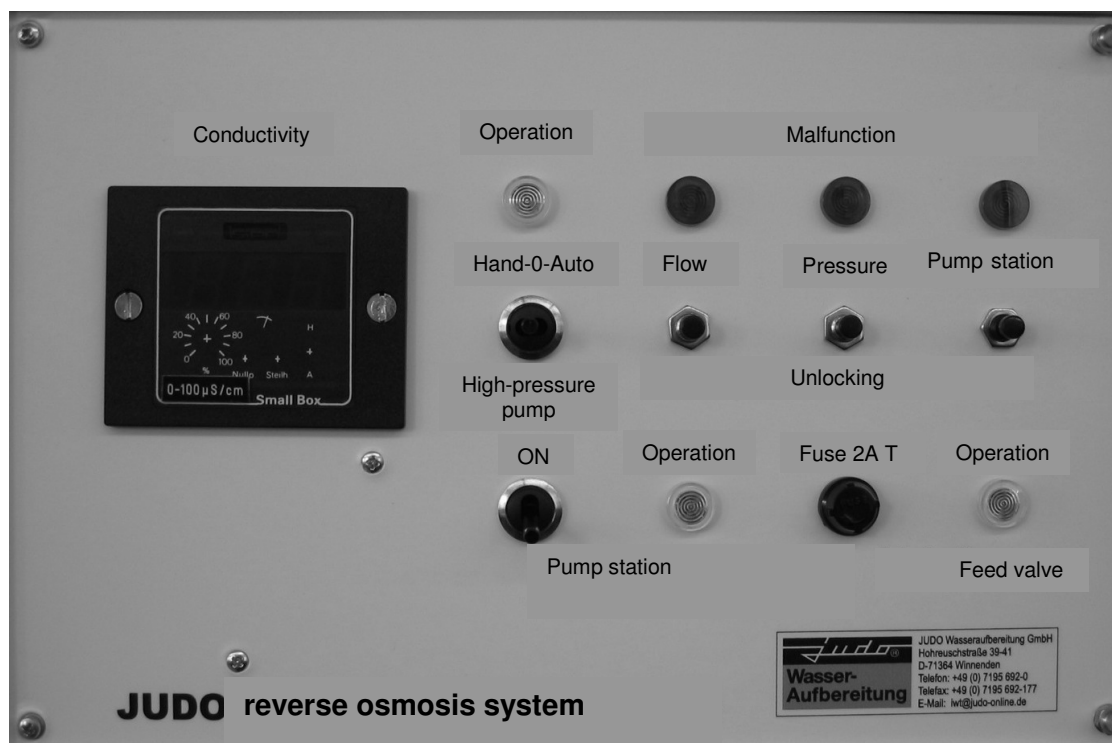
Slowly open raw water pipe and fully open control valve for concentrate. This adds water to the system and pushes the air out of the system (duration approximately 10 min). System pre-selection switch in HAND (manual) position. The JUDO reverse osmosis system starts to run. Keep the control valve for the brine recirculation closed and flush the system until the conductivity has fallen to approximately 10-12 µS/cm. (Flush out preservative, etc.) Set pressure switch to approximately 7-8 bar. If this value has been reached, slowly open the control valve for the brine recirculation until the specified concentrate and brine recirculation operating values are reached. The JUDO permeate collection tank can now be filled.



Caution

**The safety chain is non-functional in the HAND position!
Ensure that the operating pressure is kept to ≤ 16 bar.**

If the start-up has been finished the system preselection switch must be set to the AUTO position.
All AUTO functions are now ready for operation.





6.2 Use not permitted where...

Operation under the following circumstances quickly results in a defect and/or reduction of the life of important system parts:

- water temperature > 35 °C.
- pre-treatment or softening not working or not working correctly.
- operation without fine filter cartridge.
- end caps of the reverse osmosis pressure pipes are not secured.
- product water (permeate): raw water ratio (c_v) greater than the design value.
- water contaminated with oil.
- illegal chlorine content in the water.
- membrane pressure > 16 bar.



Note

The product water from new or preserved modules which is to be used as drinking water must be discarded for at least 4 hours!

6.3 Operation

The JUDO reverse osmosis system is switched on and off in AUTO mode by external consumption via level switches in the JUDO permeate tank. Level switches 3 and 4 are safety elements which protect the booster pump against dry running. Level switches 1 and 2 control feed of the JUDO permeate tank.

The inlet (solenoid valve) is opened by the start command, the high-pressure pump is switched on and all electrical interlocks, alarms as well as the conductivity meter are released. The high-pressure pump generates the pressure required for the reverse osmosis, (maximum 16 bar). If the allowable pressure is exceeded the system switches off after approximately 15 sec.

On removing product water the high-pressure pump is switched on by level switch 2 when the lower level is reached, it is switched off by level switch 1 when the upper level is reached.

The brine and brine recirculation flowing out of the modules is set to the specified flow rate by two fine control valves. Both flow rates are displayed and the brine flow to the wastewater is monitored. If the value falls below the set minimum value the system switches off after a time delay. The product water monitor indicates the quality and flow rate.

The product water reserve is used to cover consumption peaks and for pressure-less operation in the clean water pipe.



6.4 System shutdown

The JUDO reverse osmosis system is flushed with pre-treated raw water at low pressure to remove high salt concentrations from the elements (brine displacement). After the pressure pump is switched off the solenoid valve remains open and does not close until after a time delay has expired. An (optional) periodic start-up routine is integrated in some systems to protect the elements against fouling and scaling effects.

6.5 Operation

Regular checking of important system groups is useful before starting up the reverse osmosis system:

- required quality and quantity of raw water.
- system's valve positions.
- fine filter cartridges are clean.
- drain ready for receiving water.
- no leaks in the pressure pipes.
- metering pumps ready for operation.

6.6 Operating monitoring

As the JUDO reverse osmosis system is intended for automatic system operation, the following operating values must be checked with the given frequency and recorded in an operations diary.

Date and time	daily
Operating hours	daily
Raw water conductivity	daily
Raw water pH	as required
Silt density index (SDI)	as required
Raw water temperature	as required
Membrane operating pressure	daily
Permeate water conductivity	daily
Permeate water flow	daily
Brine flow	daily
Brine recirculation	daily



Note

If the values remain constant, registration of their values can be reduced to a weekly cycle!

Registering the operating data is an important part of warranty claims!

Early detection of deviations in the scheduled data for salt passage, permeate flow or pressure drop enable the owner/operator to initiate appropriate countermeasures before damage to the system or elements occurs.

6.7 Silt density index

The silt density index, also called SDI, is the measured variable which reliably describes the how dirty (fouling factor) the raw water is. The blocking index meter essentially consists of a pressure reducer and a filter holder, including the corresponding membrane filters. The raw water is filtered twice by a membrane filter 0.45 µm at 2.5 bar and 15 minute interval between each filtering operation.

The blocking index can be calculated using the following formula:

$$SDI = \frac{(1 - \frac{t_i}{t_f})100}{T}$$

where:

t_i is the basic time required on starting to filter 500 ml water through the membrane filter.

t_f is the time required to filter 500 ml water again after 15 minutes' running time since the test started.

T is the time of the test run

It should be determined while the system is running. Moisten the filter paper with raw water and insert in the filter holder. Hold the paper at the edge only. Insert O-ring and screw on housing. Open shut-off valve and set pressure reducer to 2.5 bar. The measuring cycle runs (15 min).

Silt density index:	Risk of blocking:
0...1,7	Low
1,8...3,4	Moderate
3,5...4,3	High



7 Errors

Possible difficulties in a reverse osmosis system can be detected early. Therefore the system owner/operator is advised to record the operating values and to initiate appropriate countermeasures if necessary. This enables subsequent difficulties to be avoided and expensive repairs are prevented.

The values recorded daily must be normalised to enable the system's performance to be objectively assessed and to determine whether countermeasures are to be taken or not.

The system components must be checked according to the suppliers' instructions.

Fault	Cause	Remedy
Brine flow too low	Cartridge filter is blocked	Check filter and clean or replace
	Solenoid valve is not open	Open solenoid valve via Auto position
	High-pressure pump is defective	Check pump and replace
	Control valve restricted	Re-open valve slightly
	Membrane blocked	Replace membranes
	Admission pressure too low	Check pressure increase on inlet side
	Manual valve closed	Open manual valve
Permeate flow too low	Pre-treatment inadequate	Check pre-treatment
	Membranes soiled	Replace or clean membranes
	Operating conditions have changed	Adjust operating conditions
	Raw water parameters have changed	Contact JUDO
Conductivity value too high	Raw water parameters have changed	Contact JUDO
	Brine flow too low	Check and adjust concentrate flow
	Membranes damaged	Replace membranes
	Pre-treatment inadequate	Check pre-treatment

Help with faults:

If the fault cannot be corrected using the information above you must contact your local **JUDO customer service** or an authorised specialist company.

Customer service centre

JUDO-Wasseraufbereitung GmbH
Hohreuschstraße 39-41
D-71364 Winnenden
Telefon: + 49 (0)1805/692-111*
Telefax: + 49 (0)1805/692-188*

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Stamp of installation firm:

8 Maintenance

According to DIN 1988 Part 8, each technical system requires a regular service. This service should be carried out by the **JUDO customer service** or by an authorised specialist company, which also replaces the wearing parts. The osmosis system should be serviced every 12 months at the latest.

We recommend conclusion of a JUDO service agreement so that the JUDO osmosis system is regularly checked to ensure it is functioning properly.

8.1 Pre-treatment

Individual pre-treatment stages are to be serviced according to the information given in separate supplier regulations.

Reverse osmosis

- The filter cartridges must be replaced at least every 3 months of operation.
- Check the metering and supervising devices half-yearly, unless specified otherwise.
- A proper and systematically performed service is a fundamental condition for fault-free, long-term operation of the system.

8.2 Post-treatment

Individual post-treatment stages are to be serviced according to the information given in separate supplier regulations.

8.3 Cleaning (carried out only by JUDO-specialists)

Depending on the quality of the inflowing water, reverse osmosis membranes become blocked with time, i.e. the permeate flow reduces. If blocking or scaling progresses (precipitation because solubility exceeded) the salt retention also worsens. The possible causes are, among other things:

- A** Biofouling due to formation of a slimy film on the membrane.
- B** Inorganic fouling due to metal hydroxides (Fe, Al, Mn) and silicates.
- C** Scaling (precipitation due to exceeding of the solubility) of calcium, barium and strontium salts (sulphates, carbonates, fluorides), dissolved silicic acid.



8.4 Cleaning criteria

Cleaning should be carried out as early as possible to prevent irreversible blocking as far as possible. Prophylactic cleaning is even recommended if a certain risk potential is known of. A basic rule of thumb is that cleaning should be carried out if the normalised working pressure has risen by approximately 10 % or the differential pressure within a pressure pipe has increased by approximately 30 % or significant worsening of the salt retention is observed.

Cleaning should always be carried out pressure pipe by pressure pipe. Furthermore, it is also advisable to perform a trial run without chemicals first to ensure the cleaning cycle functions properly and there are no leaks in it. Otherwise chemical losses and difficult flushing procedures can result. During the first cleaning or use of other chemicals it is advisable to check the success of cleaning after individual cleaning steps (benches or chemicals) by starting up the system. Permeate can then also be produced for the next cleaning.

8.5 Cleaning temperature

The cleaning temperature has a decisive effect of the cleaning efficacy. The optimum temperature is 40 - 45 °C. The heating up can be carried out using hot water or using a heat exchanger. However, it is always important to ensure that the temperature in the system does not exceed 45 °C. The cycle should be heated up before adding the chemicals as otherwise the modules and pipes would cool the cleaning solution.

8.6 Recommended cleaning chemicals

Acidic Citric acid 1 - 2 %, pH 2.5 - 4 with ammonia or if unavailable with NaOH
Suitable for: B, C and as final cleaning
Ultrasil 70 approximately 0.5 % pH 2 - 2.5 suitable for: B, C. Must be followed by alkaline cleaning
Peracetic acid approximately 100 - 200 mg/l
Suitable for disinfection, with subsequent alkaline cleaning

Alkaline Sodium hydroxide solution pH 10 - 11
Na dodecyl sulphonate (Na lauryl sulphate) 0.2 % pH 10-11 with NaOH
Suitable for: A, B.
Ultrasil 10 approximately 0.7 % pH 10 - 11 suitable for: A, B.
Do not use cleaning chemicals with non-ionic or even cationic constituents.
We recommend that cleaning always be carried out in a cycle: acidic - alkaline and if necessary acidic again (citric acid). The chemicals should be mixed with permeate or deionate or with soft water.



Note

Don't use cleaning agents containing nonionic or cationic ingredient!

8.7 Cleaning quantities and flows

Cleaning quantity to be added:

8" elements: 25-50 l per element.

4" elements: 5-15 l per element.

A volume in the upper range is recommended in case of severe soiling. Flow rates per parallel impinged pressure pipe (independent of the number of elements in the pipe):

8" elements: 3.0 - 8.0 m³/h per pipe, recommended 5.5 m³/h

4" elements: 0.75 - 2.0 m³/h per pipe, recommended 1.4 m³/h

8.8 Design of the cleaning pump

Maximum approximately 3 - 4 bar at nominal delivery rate.

Larger delivery heads or steep characteristic curves can be problematic as uncontrolled, excessive differential pressures can occur.

The pump should always be highly throttled (restricted) on starting. It is then accelerated up to the required flow or up to the maximum differential pressure.

8.9 Cleaning duration

A duration of approximately 1 hour is sufficient with heating. Longer circulation times can be advantages at low temperatures, approximately 2 - 3 hours.

**Important information:**

- The permeate side of the pressure pipes to be cleaned must always be relieved to the atmosphere or a pipe returned, unpressurised, to the cleaning tank. Closed permeate pipe can result in irreversible damage.
- During cleaning the pressure loss may not exceed 0.6 bar per element installed in the pressure pipe (e.g. 3.6 bar maximum for 6 m pipe).
- The pH value must be regularly checked during cleaning. The pH value can markedly change during the first 10-15 minutes and must be readjusted with alkali or acid. Add small portions only.
- Always flush the permeate between 2 cleaning operations.
- The cleaning tank should be designed so that it can completely drain.
- Samples taken from the used cleaning solutions should be examined to obtain information regarding the type and quantity of contaminations.

**Caution**

The listed work should only be carried out after consulting JUDO-Wasseraufbereitung GmbH!

Complete module flushing and cleaning systems (CIP) available on request!



9 Storage and preservation of reverse osmosis elements

9.1 General information

The reverse osmosis elements must be stored in a preservative solution to prevent the formation of biological films or coatings on the surface of the membrane. It is possible for the coatings to be responsible for changes in membrane performance. For this reason the preservative solution is a must in the following cases:

- Long-term storage of used elements
- Long-term storage of new elements
- System stoppage > 1 week

The elements should be preferably stored or sent separately outside the pressure pipe in their original packaging and not installed until just before starting up the system. Apart from the preservative solution, the storage conditions are also an important factor in minimising the formation of biological coatings or films on the surface of the membrane during storage.

9.2 Storage of new elements

The manufacturer recommends the following guidelines for optimum storage:

- (1) The elements are to be stored cool and dry inside the building. Avoid direct sunlight.
- (2) The storage should be frost proof and below 35°C.
- (3) New elements are delivered with the following preservative solution:
0.5-1 % sodium meta bisulphite solution (NaHSO_3)

The new elements are individually shrink-wrapped in a special plastic cover and are packed in a box. The box should not be opened until the elements are used.



9.3 Storage / preservation of used elements

- (1) If elements are removed from the pressure pipe for storage or dispatch reasons they must be preserved in a 500 - 1000 ppm sodium meta bisulphite solution. To make the preservative solution you will need good quality sodium meta bisulphite (preferably food quality) (sodium disulphite $\text{Na}_2\text{S}_2\text{O}_5$ is normally used which, when mixed with water changes into bisulphite $\text{Na}_2\text{S}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow 2 \text{NaHSO}_3$) and preferably permeate.
- (2) Softened, chlorine-free water must always be used, preferably permeate. The elements should lie in the preservative solution for approximately 1 hour and are then welded in a plastic, oxygen-impermeable cover. After completing the preservation and packaging the special cover should be marked with a sealing date. You can obtain the special covers through JUDO.



Note

Following preservation and packaging of the elements the same storage conditions apply as for new reverse osmosis elements!

9.4 Preservation of a reverse osmosis system

The procedure listed in the following is appropriate for a system stoppage lasting longer than 1 week. However, if the system is at a standstill for less than 48 hours, flushing in accordance with the individual system stoppage is recommended. The following procedure is recommended for long-term stoppage:

- (1) The system must be cleaned before each preservation to remove colloidal and other types of deposits on the membrane. This relates to the cases in which the membranes are already soiled or soiling is suspected. Follow the recommended standard cleaning conditions or contact JUDO regarding individual cleaning and sterilisation measures before long-term stoppage.



Note

The preservation should be carried out immediately after successful cleaning and sterilisation, however after 12 hours at the latest!

- (2) The preservation is carried out by recirculating a 500 - 1000 ppm sodium meta bisulphite solution through the cleaning system. In this way the elements are completely immersed in the preservative solution. To remove the remaining air in the system, the solution is recirculated until the remaining residue can be ignored. Ensure complete venting of the system (e.g. by sodium bisulphite solution overflow at the highest point in the system).
- (3) Following complete immersion of the elements in the cleaning solution the external air must be prevented from penetrating the system by closing the valves. Any addition of oxygen to the sodium-bisulphide solution results in oxidation of the bisulphite to form sulphate and a steady fall in pH value. After the bisulphite has been used up the oxygen is no longer consumed and the biostatic conditions become unstable.
- (4) The pH value in the preserved reverse osmosis system must be regularly checked (at least once per week) to ensure that the pH does not fall below 3. The preservative solution must be replaced once per month.
- (5) The system must be kept frost-free during the stoppage period. The maximum ambient temperature should not exceed 35 °C.

10 Decommissioning

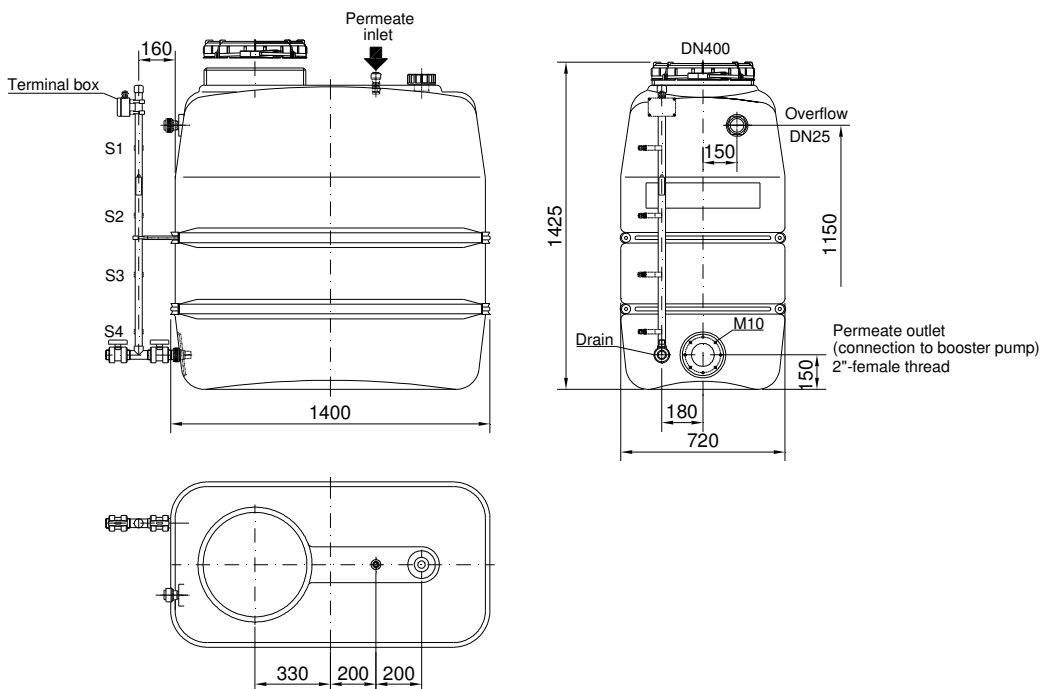
The decommissioning is carried out by setting the electric switch for system preselection to "0". The shut-off valve must be closed.

In the event of stoppages ≥ 1 week the fine filter cartridge must be removed. If there is a possibility of bacteria growth or if the modules are severely soiled, complete the procedure according to Chapter 8.3 or 8.4.

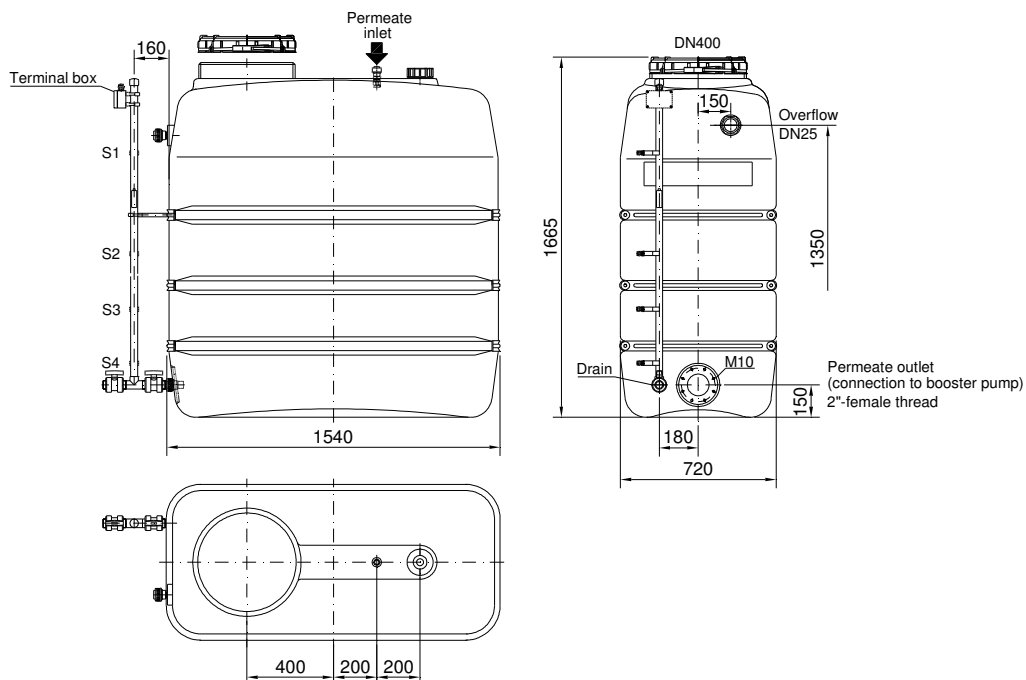


11 Permeate storage tank

JRB 1000

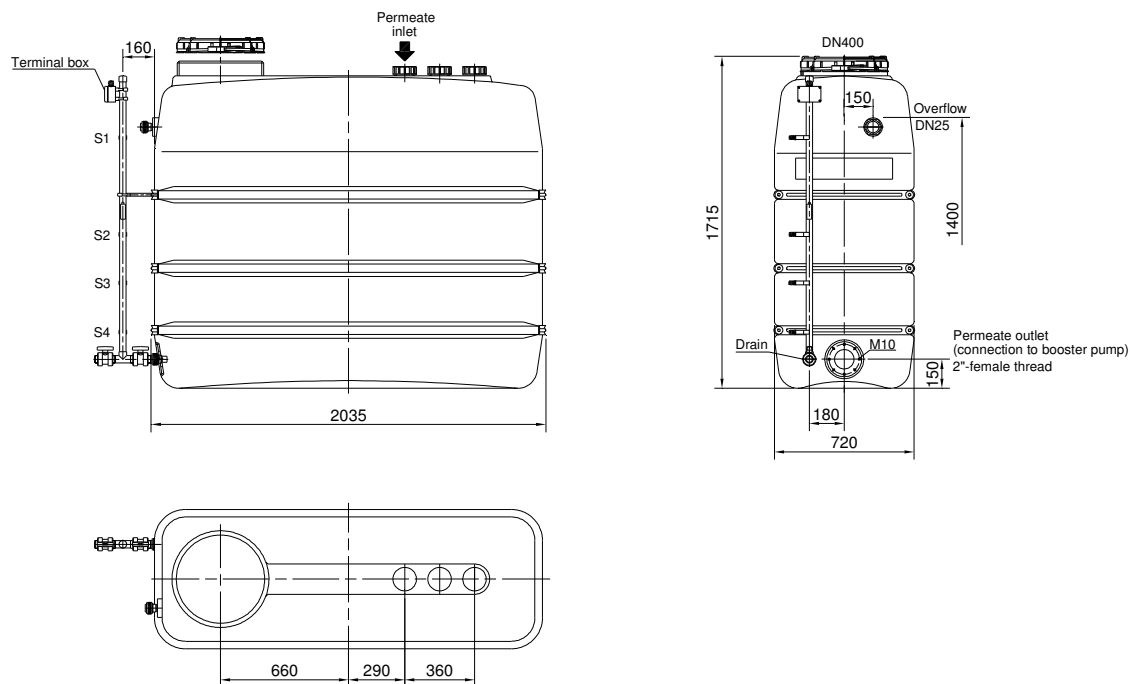


JRB 1500

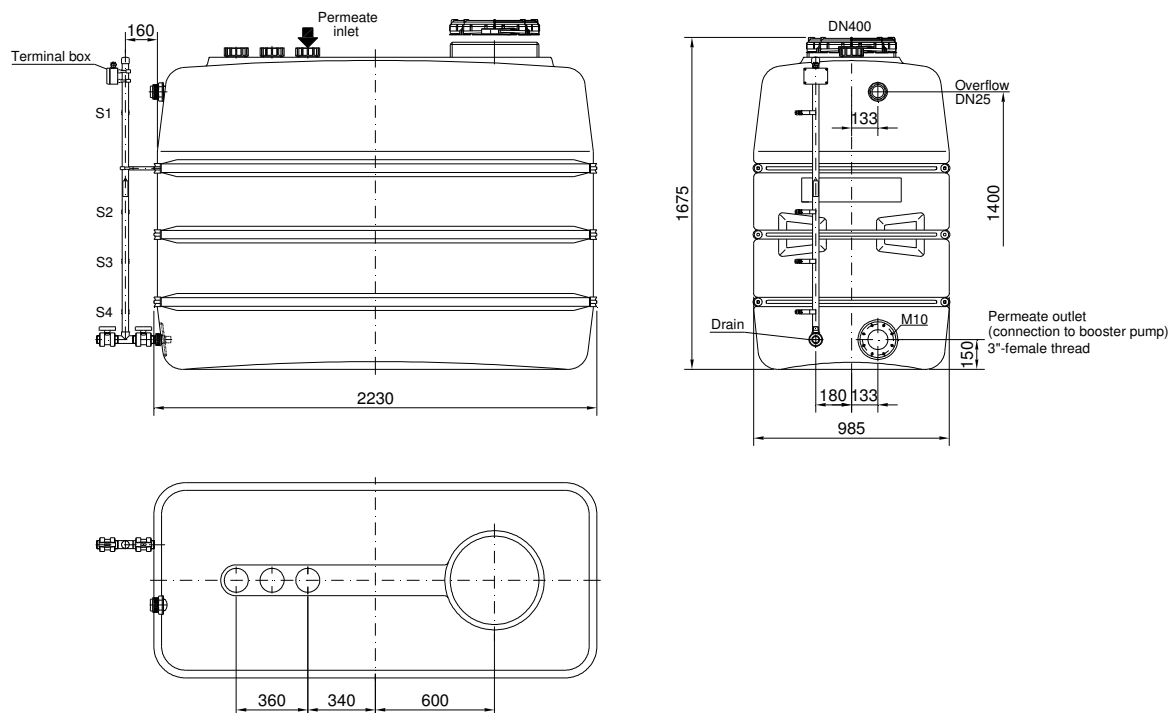




JRB 2000



JRB 3000



Date created: 29.05.09

Release date: 03.06.09

Operating instructions: JUDO reverse osmosis system JOS 16-30G

Revision date: 03.06.09

Version: 1.000

Operating instructions: JUDO reverse osmosis system JOS 16-30G

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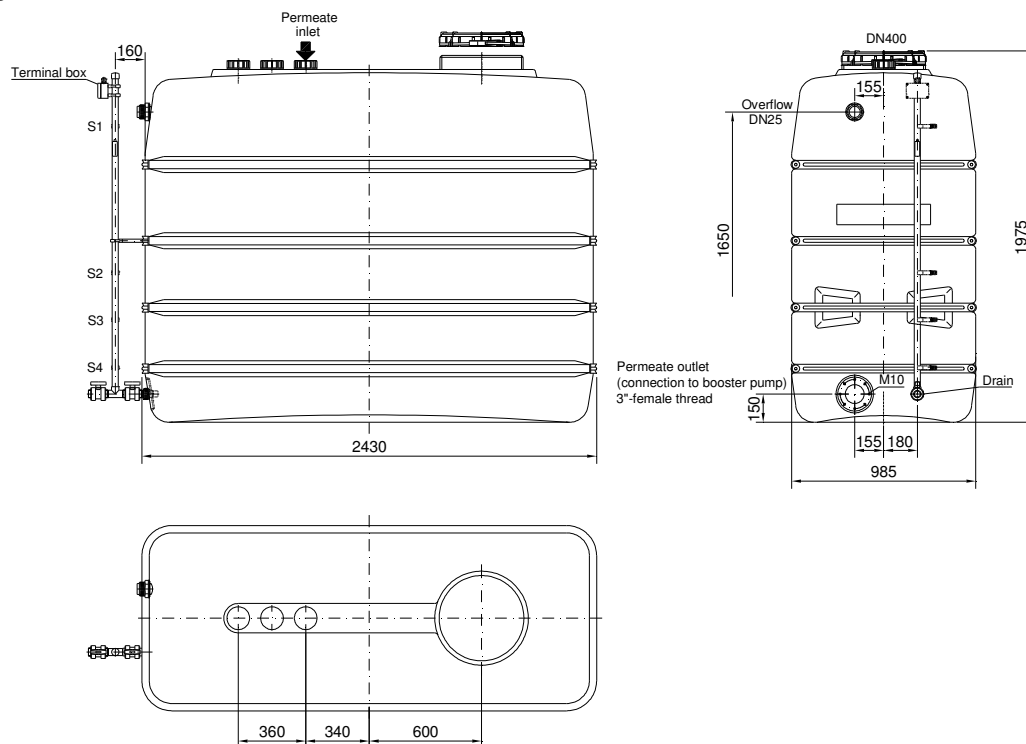
* 14 Cent/min. out of the German landline

In the interests of engineering progress, subject to change without notice!

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JRB 4000



Date created: 29.05.09

Release date: 03.06.09

Operating instructions: JUDO reverse osmosis system JOS 16-30G

Revision date: 03.06.09

Version: 1.000

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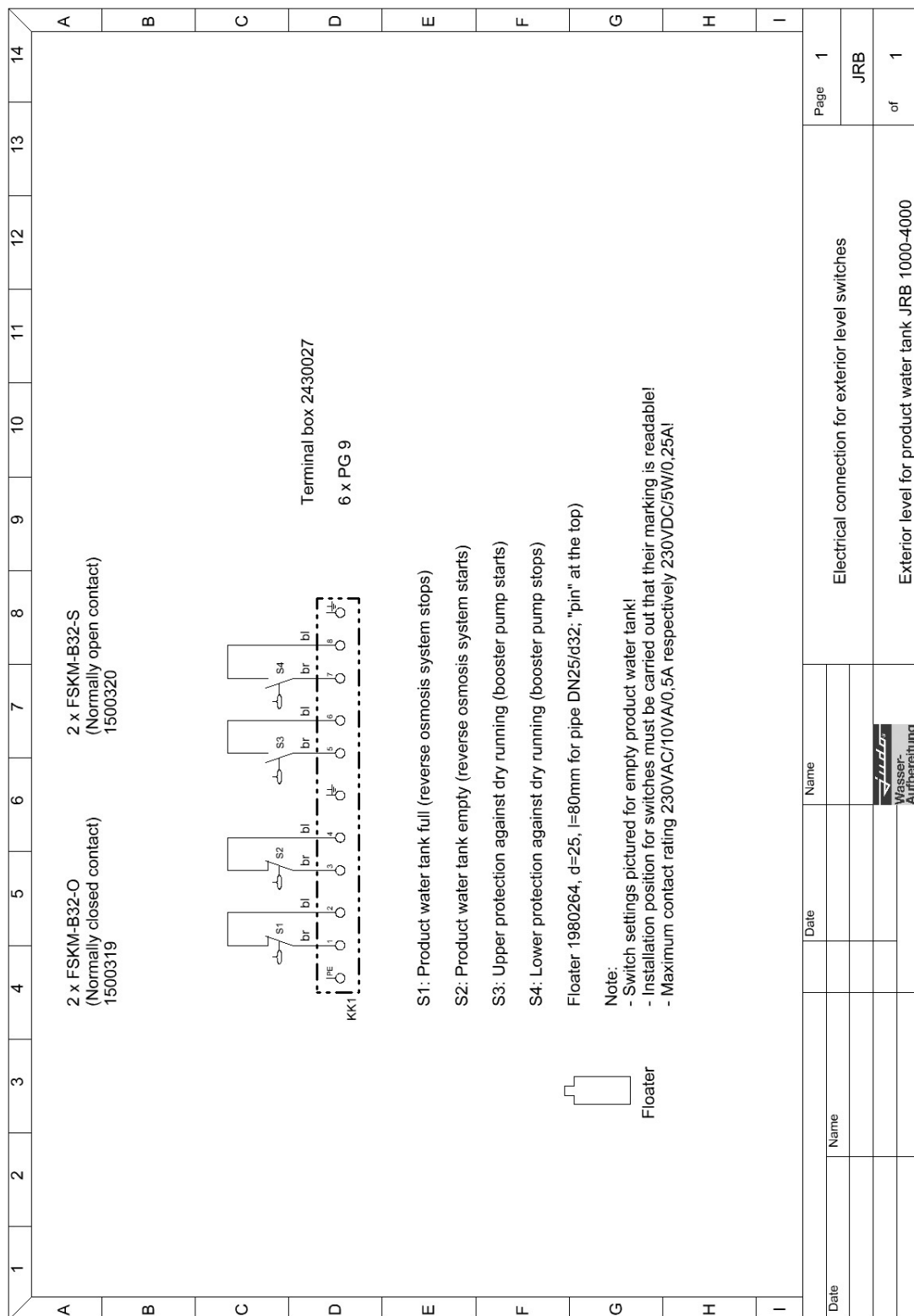
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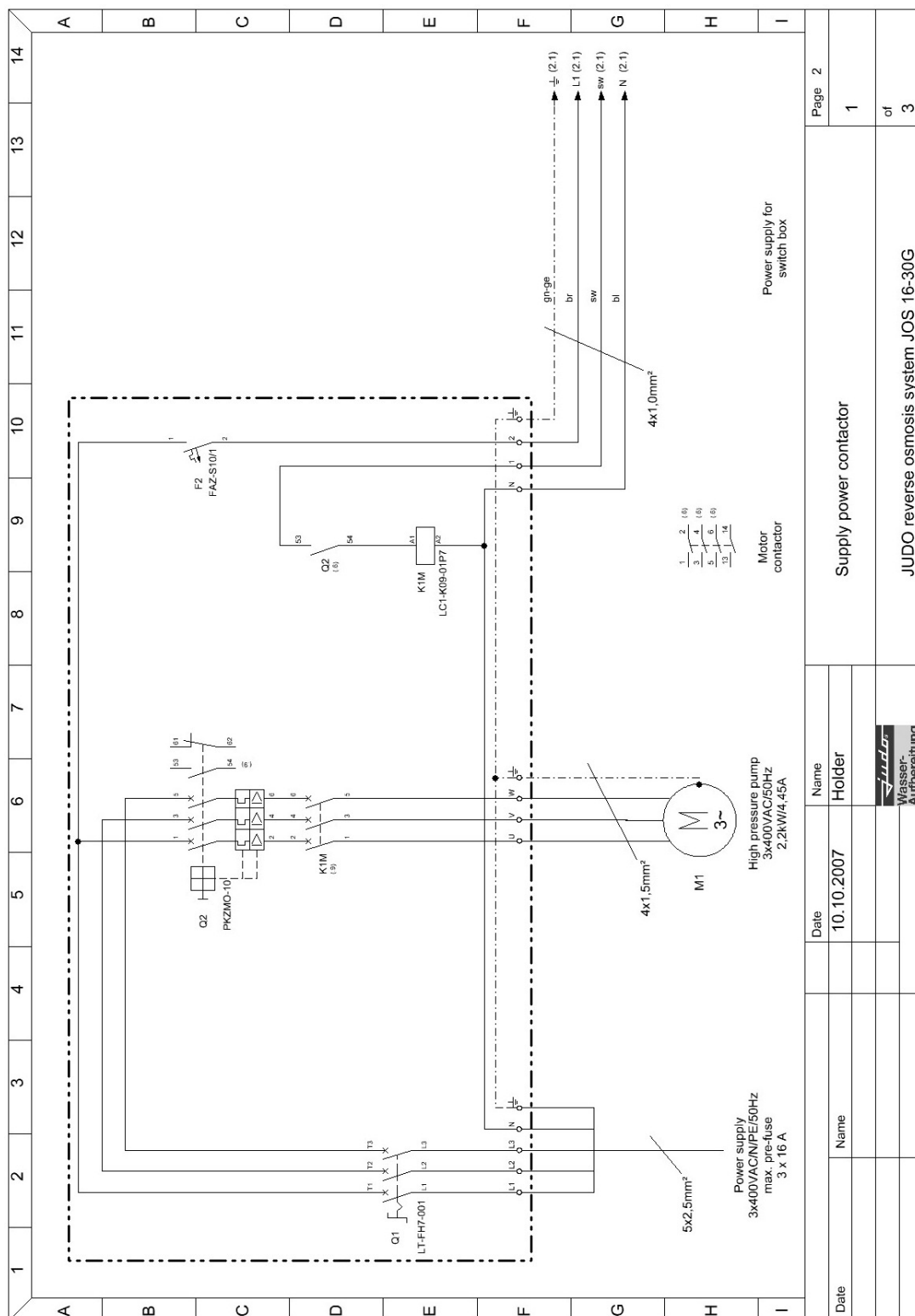
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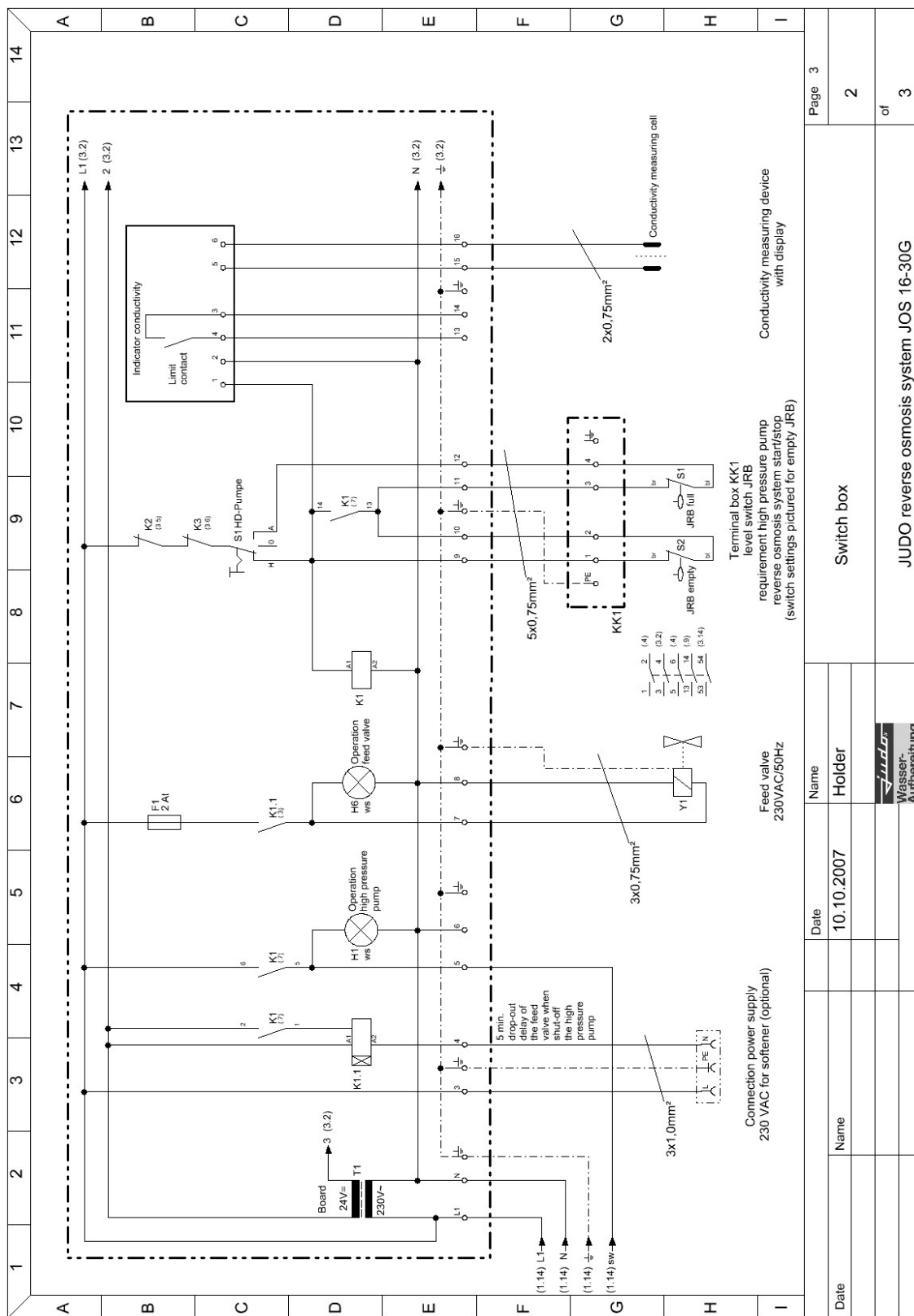
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11.1 Electrical connection for exterior level switches



12 Control circuit





Date created: 29.05.09

Release date: 03.06.09

Operating instructions: JUDO reverse osmosis system JOS 16-30G

Revision date: 03.06.09

Version: 1.000

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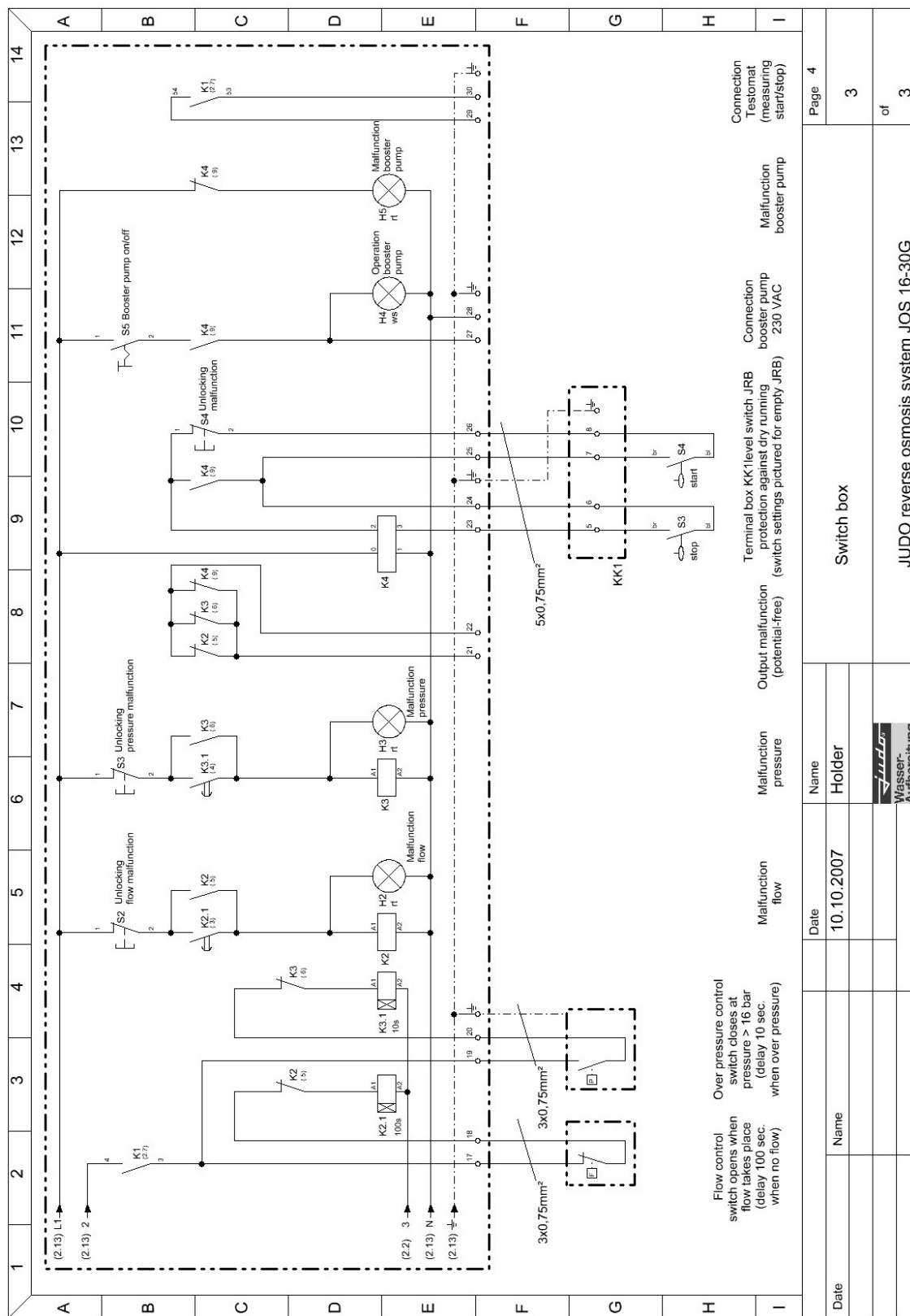
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13 Spare parts list

Benennung	Order No.	JOS 16G	JOS 20G	JOS 30G	No.
Switch box	2470013	X	X	X	1
Power contactor	1980065	X	X	X	1
Conductivity measuring device R $\frac{1}{2}$ "	1510051	X	X	X	1
High pressure pump (rotary vane pump)	1980397	X	X		1
High pressure pump (rotary vane pump)	1980211			X	1
Pressure switch DCM 40	1500073	X	X	X	1
Solenoid valve $\frac{3}{4}$ "	8735113	X	X	X	1
Minimum limit value pickup	1610292	X			1
Minimum limit value pickup	1610187		X	X	1
Pressure gauge 0-10bar	1510046		X	X	2
Pressure gauge 0-25bar	1610295	X	X	X	1
Level switch (N.C.C.)	1500319	X	X	X	2
Level switch (N.O.C)	1500320	X	X	X	2
Filter cartridges JFK-PP5-10"	8714597	X	X	X	2
Flow meter with magnet 100-1000 l/h	1610291	X			2
Flow meter with magnet 40-400 l/h	1610297	X			1
Flow meter 100-1000 l/h	1610197		X	X	1
Flow meter 150-1600 l/h	1610302		X	X	1
Flow meter with magnet 100-1000 l/h	1610533		X		1
Flow meter with magnet 60-640 l/h	1610231			X	1
RO element TMG 10 4"-40"	1980279	X			3
RO element TMG 10 4"-40"	1980279		X		4
RO element TMG 10 4"-40"	1980279			X	6